8-1985

The Effect of Creative Thinking Instruction on Seventh and Eighth Graders and the Relationship of Creative Thinking to IQ and Reading Achievement

Judith A. Brooks
The College at Brockport

THE EFFECT OF CREATIVE THINKING INSTRUCTION ON SEVENTH AND EIGHTH GRADERS, AND THE RELATIONSHIP OF CREATIVE THINKING TO IQ AND READING ACHIEVEMENT

THESIS

Submitted to the Graduate Committee of the
Department of Curriculum and Instruction
Faculty of Education
State University of New York, College at Brockport
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Education

by

Judith A. Brooks

State University of New York, College at Brockport
Brockport, New York

August 1985

SUBMITTED BY:

Judith A Brooks

APPROVED BY:

Arthur E. Smith 8/6/85

Thesis Advisor Date

Janice L Berry 8/6/85

Second Faculty Reader Date

Robert B. Kribbs 8/11/85

Chair Date

Graduate Policies Committee

Abstract

The purpose of this study was to determine if the creative thinking skills of seventh and eighth grade students could be strengthened through classroom activities designed to stimulate fluency, flexibility, and originality. Also sought were the correlations between creativity scores and IQ, and between creativity scores and reading comprehension.

This study can be considered a replication of Hicks's 1979 research, though applied to older children.

The subjects were seventh and eighth graders attending an urban fringe parochial school. They composed a racially integrated reading class grouped according to reading level and content area teachers' recommendations, rather than according to proficiency in specific reading skills or IQ scores.

The effect of a treatment period of eight weeks, with twenty minutes three times weekly, was evaluated by a pretest and posttest using the Torrance Tests of Creative Thinking (TTCT). A correlated *t* test was used to test this study's hypotheses.

The finding of this study indicated that the fluency and flexibility skills of seventh and eighth

grade students were not enhanced by an eight week treatment program. There was a statistically significant difference in the pre- and posttest means for originality.

The correlations between IQ and the creativity variables ranged from no important relationships upward to those approaching a weak relationship. No significant relationship was found between total reading com~ehension and the creativity variables. A weak relationship was found between reading and IQ scores.

Table of Contents

List of Tables

Chapter I

Statement of the Problem

Purpose

The purpose of this study was to determine whether the creative thinking abilities of seventh and eighth grade students could be strengthened through the use of classroom activities designed to enhance fluency, flexibility, and originality. A second purpose was to investigate the relationships between IQ and creativity, and between reading comprehension and creativity.

Need for the Study

Investigations into the development of creative behaviors have attempted to cover a wide range of ages, intelligence levels, and socioeconomic backgrounds since the early definitions and identifications of creativity offered by researchers such as Osborn (1953), Feldhusen (1965), and Torrance (1972). Still the controversy exists between researchers having success with increasing creative thinking in the educational setting and those finding less encouraging results.

Creativity may not result from teaching. Wallach (1973) questioned if creativity training has application to real-world situations. Until research concludes that

such training consistently results in original products, processes, and ideas, he encouraged schools to concentrate on cognitive development. Travers (1973) agreed with Wallach on the possible lack of transfer of creativity to real life. Milgram (1981), from her study involving the effect of reinforcement on creative thinking in subjects from different intelligence and economic groupings, maintained that more research is necessary before ideational fluency measures are valid predictors of typical life situations. A study by Despos (1980) showed no significant increase in creative behaviors following an eight week treatment period with third and fourth graders.

Of the proponents for the value of teaching creativity, Thomas and Feldhusen (1971) reported success in strengthening creative thinking abilities using the Purdue Creative Thinking Program with fourth, fifth, and sixth graders. Torrance (1972) offered nine categories of means for enhancing creativity and reported high percentages of increases in creativity after treatment periods. Hicks (1979) found significant gains in fourth graders' creativity posttest scores following an eight week treatment program focusing on developing fluency, flexibility, and originality. Glover (1980), in a study

of university undergraduates, discovered both short-term and long-term increases in fluency, flexibility, and originality after conducting a creativity-training workshop. University freshmen and senior women showed various increases in creative behaviors following creative perception training sessions in research done by Daniels (1984), who anticipates researchers discovering that offering creativity training to women, even to girls as young as elementary students, will benefit society with more creative products than females have been contributing so far.

Researchers have investigated the relationship between creativity and intelligence. No significant relationship between the two was found by Torrance (1963). Guilford (1975) found only a low correlation between IQ scores and creativity. Barron (cited in Hicks, 1979) found that intelligence is not a basis for creative thinking, but that applying intelligence in a creative way depends on an individual's personality. Torrance (1962) replicated a study by Getzels and Jackson and concluded as they did in a majority of his situations that there were low, positive correlations between creativity and intelligence. Hicks (1979) reported a significant relationship between IQ and creativity, showing more intel-

ligent subjects performing more creatively than the less intelligent. Milgram (1981), while introducing reinforcement as a factor in encouraging creativity, found that subjects ranging from low average to gifted intellectual ability showed no significant increases in the quality or quantity of responses. Further research is needed to establish conclusions about the relationship between intelligence and creativity, if educators are to know if and to whom creativity training should be aimed.

Little has been done to discover the relationship between creativity and reading achievement. Circirelli (1965) showed no significant correlation between reading achievement and creativity using the Minnesota Tests of Creative Thinking. Hicks (1979) established significant correlations for the creativity pretest scores in originality and inferential comprehension. Among seven of nine variables significant correlations appeared after the creative thinking treatment program. Despos (1980) found no significant correlations between reading comprehension and flexibility, originality, and elaboration on posttest scores, but found a significant correlation between reading and creative fluency. Belk (1982) concluded that there was no significant difference in achievement in

learning spelling words between high creative and low creative children regardless of participation in a creativity training program.

Questions to be Answered

The following questions were investigated:

1. Can the creative thinking abilities of seventh and eighth grade students be enhanced by classroom activities designed to develop fluency, flexibility, and originality?

2. Does a statistically significant relationship exist between creative thinking ability and intelligence?

3. Does a statistically significant relationship exist between results on a test of reading achievement and a creative thinking test?

Definition of Terms

Terms requiring definition are creative thinking, flexibility, fluency, IQ, originality, and reading comprehension.

Creative thinking is the emergence in action of a novel relational product, growing out of the uniqueness of the individual on the one hand, and the materials, events, people, or circumstances of his life on the other (Rogers, 1959).

Flexibility is the ability to adapt to changing instructions, to be free from inertia of thought, and to use a variety of approaches (Torrance, 1963).

Fluency is the ability to produce a quantity of ideas to fulfill certain requirements in a limited amount of time (Torrance, 1963).

IQ is the indication of an individual's intelligence quotient as measured by the Otis Lennon Mental Ability Test.

Originality is the ability to produce uncommon responses and to recognize an idea as being unique or unusual (Torrance, 1963).

Reading comprehension is the ability to recall explicitly stated information in a reading passage, and, drawing upon intuition and experiential background, to conjecture and hypothesize about what is read (Hicks, 1979).

Limitations of the Study

This study was limited to 24 seventh and eighth grade students in an urban fringe parochial elementary school. Students participating in this study comprised all members of one developmental reading class.

The data for this study were limited to results of whole-group testing.

Summary

Research has indicated a need for further study in the area of the development of creative behaviors. Previous investigations suggest a decline in creativity in fourth and seventh grade students. Further studies need to be conducted to determine the relationship of creativity to intelligence and reading achievement.

This study was designed to determine whether the creative thinking abilities of seventh and eighth grade students could be improved through the use of classroom activities designed to develop fluency, flexibility, and originality. Relationships among creative thinking, IQ, and reading achievement were also investigated.

Chapter II

Review of the Literature

Purpose

The purpose of this study was to determine whether the creative thinking abilities of seventh and eighth grade students could be strengthened through the use of classroom activities designed to enhance fluency, flexibility, and originality. A second purpose was to investigate the relationships between IQ and creativity, and between reading comprehension and creativity.

Strengthening Creative Behaviors

A review of the literature reveals the unresolved issue of the necessity or efficacy of educators' providing instruction and practice in creative thinking.

With the definitions of flexibility, fluency, and originality, among other aspects of creative thinking, Guilford's structure of the intellect model (1959) enabled educators to explore specific components of creative thinking ability. He stated that there seems to be a fluency factor(s) in creative talent. However, not all creators need be constrained by time to produce rapidly or not at all. The individual who can produce many ideas in

a certain length of time has the advantage in arriving at significant ideas. Guilford described originality as how often a person offers uncommon, but acceptable, responses to items, such as on a word-association test, similes test, and connotative synonymns lists. Flexibility relates to how easily a person can change set -- how a person readily follows new lines of thought. He stressed that the curriculum and methodology should aim to develop creative abilities, as creative maturity can only be reached through instruction, practice, or challenge.

Skipper (1970) found that early creativity research, responsible for methods of identifying creativity, has been followed by investigations of teaching procedures designed to stimulate independent thinking, idea testing, and communicating ideas to others.

Also promoting the teaching of creativity were Torrance (1972) and Allen (cited in Hicks, 1979). Torrance stated that he knows it is possible to teach children to think creatively and this can be done through various means. He saw that creative thinking comes very naturally to most children. He presented in a list nine categories of means for enhancing creativity:

1. training programs emphasizing the Osborn-Parnes Creative Problem Solving procedures or modifications of

them. Bond (cited in Torrance, 1972), Eberle (1967), and Yee (1973) used this program with over ninety percent success. The total success rate of the 142 studies Torrance conducted which included the Osborn-Parnes program was seventy-one percent.

2. training in general semantics, creative research, and the like

3. complex programs produced, such as the Purdue Creativity Program; Covington, Crutchfield, and Davies' Productive Thinking Program; and the Myers and Torrance ideabooks

4. creative arts as vehicles for teaching and practicing creative thinking

5. media and reading programs that teach and give practice in creative thinking

6. curricular and administrative arrangements that foster learning and practicing creative thinking

7. teacher-classroom variable, indirect and direct control, classroom climate, and the like

8. motivation, reward, competition, and so forth

9. test situations where higher level creative functioning or more valid and reliable test performance are promoted. The most successful approaches appear to be those involving cognitive and emotional functions,

and giving structure and motivation, opportunities for involvement, practice, and interaction with teachers and other children. Deliberate teaching seems to be a necessary ingredient in a child's using or developing his creative thinking ability. Torrance felt it is possible to increase the creative thinking abilities of nearly every child, especially if divergent, rather than convergent, thinking is stressed. Allen instructed educators to offer creativity training and challenge to every student in lieu of aiming only for proficiency in basic skills.

Many researchers have found that certain approaches appear to enhance creativity. Thomas and Feldhusen (1971) reported on the value of the Purdue Creative Thinking Program. This program's series of audio tapes focus on providing practice in fluency, flexibility, originality, and elaboration, especially as part of a social studies curriculum. Thomas used the Purdue Program with fourth, fifth, and sixth graders and concluded that the subjects' creative thinking abilities were strengthened. Thomas' study failed to answer the questions of how effective a teacher is who uses such a program, or if a highly creative teacher is necessary. Torrance (1972) related that Bahlke, Starks, and Feldhusen found the Purdue Program valuable, especially for fourth graders.

Lytton (1972) suggested that schools may strengthen children's creative behaviors by offering special educational experiences for deliberately training creative thinking or problem solving skills apart from the regular curriculum. He also saw the value in schools creating an experimental, creative, open-ended approach to learning in each of the various curriculum areas.

In her study, Hicks (1979) discovered that after an eight week treatment program involving activities she designed to stimulate fluency, flexibility, and originality, fourth graders showed a significant difference between the mean scores of the pretest and posttest of verbal forms of the Torrance Tests of Creative Thinking. She concluded that creative thinking abilities could be enhanced through the use of classroom activities.

Reported by Despos (1980), Miller (1975) found that lessons designed to train productive thinking skills could be effective, and a study by Treffinger and Ripple (1968) showed gains by fourth graders trained in productive thinking that were significantly greater than the control group's.

Glover (1980), having conducted for 58 sophomore and junior educational psychology undergraduates a creativity-training workshop using instructions, practice,

and reinforcement found an increase in fluency, flexibility, and originality on both unusual uses and problem solving exercises. Also, scores on the Torrance Tests of Creative Thinking showed increases immediately after the workshop -- increases still apparent eleven months later during a follow-up with the same creativity assessment. No comparable effects stood for a control group not participating in the workshop. Further research focusing on short- and long-term effects on the creative behaviors is indicated.

A study by Milgram (1981) and Feingold stated that both verbal and concrete reinforcement increased the number of overall responses in disadvantaged seventh graders, with concrete reinforcement being more successful. There have been few studies comparing the effects of reinforcement on creative thinking as it was in Milgram's study of ideational fluency in original problem solving ability.

Daniels (1984) exposed university freshmen and seniors to two (1½-2 hours) creative perception training sessions with 20 activities designed to stimulate and/or promote inquiry, flexibility, questioning strategies, attribute listing, morphological analysis, synectics, fluency, originality, and tolerance for ambiguity. The

training activities stimulated creativity in that the subjects enjoyed more challenging tasks, preferred adventure over routine, disliked doing things in a prescribed routine, and increased inquiry, questioning strategies, originality, and artistic products. He implied that creativity can be enhanced if students are provided techniques designed to foster creative behaviors. He felt that university courses need to involve more analytical thinking and decision-making rather than mere rote memorization.

Not everyone promotes teaching and practicing creative thinking. Wallach (1973) said that schools fail to supply children with at least elementary cognitive skills (e.g., the ability to read). "Children don't need to read 'creatively,' they just need to be able to read." This particularly applies to children with low-income backgrounds. He challenged the idea that an original product will necessarily be the result of creativity training. He would rather stress cognitive development.

Travers (1973) agreed that the transfer of creative thinking strategies to real life situations is doubtful, and he also felt that the task of being creative is much more than training individuals to think

up quantities of clever ideas.

Maslow (cited in Despos, 1980) attributed creativity to mental health, not to instruction. He directed schools to establish an environment conducive to good mental health. Despos also stated Gowan's report that the sudden quantity of new ideas which are brought to consciousness are based on a subconscious accumulation of material that surfaces in an environment of relaxation and incubation. He suggested practicing imagination and imagery as one activity that might help creative ideas surface.

Despos's (1980) study showed no significant differences between the posttest scores of the Torrance Tests of Creative Thinking after an eight week treatment period with third and fourth graders either in the control or treatment group.

Milgram (1981), while introducing reinforcement as a factor in encouraging creativity in 142 middle- and lower-class children, from 7 to 13 years old, and of low average to gifted intellectual ability, stated that subjects showed no significant increases in the quality or quantity of responses.

Creativity and Intelligence

Another controversial issue concerns the relationship between intelligence and creativity. Flescher (1963) compared high IQ test scorers having low creativity test scores with high creativity test scorers having low IQ test scores. Getzels and Jackson (1962) did this also, but Flescher added a group with high scores on both IQ and creativity measures, and a group with low scores on both measures. He found that creativity is not closely related to achievement in the way IQ is, due to the high correlation between IQ and achievements tests. He also found a very low correlation between his creativity indexes and IQ (.09) and then questioned the validity of creativity tests. Getzels and Jackson had found low, positive correlations between creativity and intelligence. Torrance (1962) replicated the Getzels and Jackson study also. His subjects were five elementary school groups, one high school group, and two graduate student groups. Torrance stated that in three-fourths of his situations the high IQ-high creative subjects performed as did Getzels and Jackson's high creative-low IQ (IQ score average of 127) subjects.

Edwards and Tyler (1965) questioned the relationship between ability test scores and success as measured by

standardized achievement tests. Two creativity tests (Torrance Tests of Creative Thinking) were given to 181 ninth graders. They were also given the School and College Achievement Test (SCAT) and Sequential Tests of Educational Progress (STEP) batteries. Students scoring in the upper third on SCAT but not on creativity were compared with the upper third on the high creativity test who were not so on the SCAT. The high SCAT group was superior on both school grade-point average and STEP scores. They tested Torrance's threshhold hypothesis (high SCAT and high creativity), a twice talented group by comparing that group with the high SCAT group. The two groups did not differ in STEP scores but the twice talented group was significantly lower than the high SCAT group on grade-point average. The first experiment found that success with creativity tests did not relate to school achievement, whereas success with SCAT did. This disagreed with Getzels and Jackson, and Torrance. Their second experiment said that Getzels and Jackson's and Torrance's findings about the relationship of creativity scores to academic achievement being general is limited. They seem not to apply to all students, all schools, and all intelligence and creativity tests. Edwards and Tyler found most practical the implication that time-honored scholastic aptitude tests are not made obsolete by recent

creativity research. SCAT and similar tests are more dependable as predictors of school achievement that are creativity tests.

Kurtzman (1967) investigated the relationship between intelligence and creativity in ninth graders and found more creative behaviors shown by the more intelligent individuals.

Hicks (1979) concluded that there was a significant relationship between IQ and the fluency, flexibility, and originality components of the Torrance Tests of Creative Thinking, and that the more intelligent fourth grader performed more creatively than subjects exhibiting less intelligence.

Hicks (1979) reported that several researchers have investigated the relationships of environment and personality to IQ, creative behaviors, and achievement: MacKinnon (1962) found creative behaviors dependent on a minimum of intelligence, with environment and personality instrumental in creativity beyond that minimum. Sisk (1972) concluded that gifted subjects' creativity increased as self-concept grew more positive. Barron's (1975) study of Air Force officers showed that creativity was not based on intelligence, but on the facet of the subject's personality which allowed him to behave creatively. Drevdahl (1961) found that family, emotional, and educa-

tional environment influenced creativity -- creativity which was shown most by individuals of moderately superior intelligence. Walker (1964), Wallach and Kogan (1965), and Boersma and O'Bryan (1968) concluded that a casual environment fostered creativity, regardless of intelligence level. However, Williams and Fleming (1969) showed that following administration of an IQ test, providing preschoolers with a playlike setting for the administration of fluency tests did not affect the intelligence-creativity relationship.

Milgram (1981) found that all subjects in her study, ranging from low average to gifted intellectual ability, failed to benefit concerning quality or quantity of responses on problem solving tasks when given verbal reinforcement during sessions designed to investigate ideational fluency.

Creativity and Reading Achievement

Still another, but less researched, area of debate deals with the relationship between reading achievement and creativity. Circirelli (1965) found significant correlations between creative behavior and various areas of achievement. However, he found no similar results between creativity and reading achievement.

Feldhusen, Denny, and Condon (1965) found no relationship between anxiety level and subject performance on five creativity tasks for junior high school students. Their purposes were to clarify the relationship between anxiety and the divergent thinking functions of ideational fluency, flexibility, and originality; to compare the relationships between anxiety and divergent functions with relationships between anxiety and convergent functions when both sets of relationships are measured on the same subject population; and to seek the realtionships between subjects' self-ratings of creative behaviors and their scores on certain measures of divergent thinking. This study found no relationship of anxiety with creativity self-rating scores and supported Feldhusen and Denny's earlier study. However, a consistent pattern of low negative relationships was found for males between creativity self-rating scores and most of the convergent scores. A correlation significant at the .01 level existed between creativity self-rating scores and originality in males. The researchers refrained from speculating on causality. Indicated is there may be a unique variance in the divergent thinking test scores which could be used to supplement SCAT or another test in predicting academic achievement.

Torrance (1972) stated that the creative individuals have their own motivation to achieve and can deal with school in a way to help themselves succeed.

Yamamoto (cited in Hicks, 1979) used ninth through twelfth graders and found that on the Iowa Tests of Educational Developments, both grade levels' highly creative group scored as well as did the highly intelligent group on all subtests.

Begy and Hicks (1980) in a study with fourth graders found significant correlations between literal, inferential, and total reading comprehension with one or more of the creativity variables of fluency, flexibility, and originality, as tested by the Torrance Tests of Creative Thinking.

Despos (1980) reported other researchers finding gains in reading: Parnes (1967) discovered that researchers saw that subject-matter courses involving creative thinking training showed no losses, and in one study gains, in subject-achievement. Haggard (1977) concluded that a Creative Thinking-Reading Activities approach strengthens reading comprehension and creative behaviors.

Belk (1982) studied 79 third graders forming 2 groups, with one receiving convergent teaching of spelling and the other receiving divergent methods. After 28 weeks of 25 minutes daily 4 days a week, Belk concluded that

using neither convergent nor divergent methods for teaching spelling show significant differences in achievement. Low creative children achieved as well as high creative children; high creative and low creative children both achieved as well using a divergent or convergent method of teaching. There is a need for research concerning the teaching methodology to enhance creative ability.

Summary

Researchers disagree on whether creative behaviors can be strengthened through instruction. Some programs and methods have proven their worth in developing creativity. The question has been asked if once creativity has been enhanced, can it be applied to real-world situations.

Several studies have been conducted with fourth graders, who along with seventh graders, are thought to experience a drop in creativity at those levels.

Further research is needed in establishing the relationships among creativity, intelligence, and reading achievement.

Chapter III

The Research Design

Purpose

The purpose of this study was to determine whether the creative thinking abilities of seventh and eighth grade students could be strengthened through the use of classroom activities designed to enhance fluency, flexibility, and originality. A second purpose was to investigate the relationships between IQ and creativity, and between reading comprehension and creativity.

Hypotheses

The following null hypotheses were investigated:

There is no significant difference between the mean scores of the pretest and the posttest of the Torrance Tests of Creative Thinking in the area of fluency after an eight week treatment program.

There is no significant difference between the mean scores of the pretest and the posttest of the Torrance Tests of Creative Thinking in the area of flexibility after an eight week treatment program.

There is no significant difference between the mean scores of the pretest and the posttest of the Torrance Tests of Creative Thinking in the area of originality after an eight week treatment program.

There is no statistically significant relationship existing between creative thinking ability and intelligence.

There is no statistically significant relationship existing between results on a test of reading achievement and a creative thinking test.

Methodology

Subjects

The subjects in this study were 24 student (6 male seventh and 5 male eighth graders, and 11 female seventh and 2 female eighth graders). They composed one developmental reading class in an urban fringe parochial elementary school.

The average grade equivalent score for total reading comprehension on the Stanford Achievement Test administered five months prior to the study was 8.5. The range was 6.0 to 12.3.

The average IQ score on the Otis Lennon Mental Ability Test administered to seventh graders yearly by the school district was 109 for present seventh graders and 98 for present eighth graders. The average IQ for the whole group was 105.

Instruments and Procedures

The Torrance Tests of Creative Thinking - Verbal Form A was administered as a pretest, and Form B was administered as a posttest. Both tests were researcher-administered to the total group. Scores were obtained for fluency, flexibility, and originality.

Treatment consisted of three twenty-minute sessions per week for eight weeks.

Twenty-one activities, developed by Hicks (1979), were presented to stimulate fluency, flexibility, and originality. Activities employed individual written activities, small group discussions, and whole group brainstorming. Lesson plans are included in the Appendix.

According to Hicks' (1979) using Feldhusen and Treffinger's model (1977), the following guidelines were followed during all of the creative thinking lessons:

1. Support and reinforce unusual ideas and responses of students.

2. Create a climate of mutual respect and acceptance among students and between students and teacher, so that students can share, develop, and learn together and from one another as well as independently.

3. Listen to and laugh with students. A warm supportive atmosphere provides freedom and security in exploratory thinking.

4. Let everyone get involved, and demonstrate the value of involvement by supporting student ideas and solutions to problems and projects.

An IQ score for each student was obtained from the Otis Lennon Mental Ability Test. This test was administered by seventh grade homeroom teachers as part of the school system's spring evaluation program.

A reading level for each student was obtained from group administration of the Stanford Achievement Test, also as part of the school system's evaluation program. This test includes vocabulary, reading comprehension, spelling, language, and word study skills in the total reading achievement score.

Statistical Analysis

A correlated *t* test of differences between two means was used to compare the mean scores of the pretest and the posttest of the Torrance Tests of Creative Thinking.

Correlations were established between IQ and creativity, and between reading and creativity.

Summary

This study investigated whether the creative thinking abilities of seventh and eighth graders could be strengthened. Both Forms A and B of the Torrance Tests of Creative Thinking were administered as a pretest

and posttest respectively to assess the subjects' creative thinking abilities in terms of fluency, flexibility, and originality. Students participated in activities designed to improve these skills during an eight week program. The lessons were designed by Hicks (1979) and applied to a higher grade level. The data were analyzed by comparing the mean scores of the pretest and the posttest using a correlated t test. Correlations were established between reading achievement and creativity, and between IQ and creativity. These correlations were based on scores from the Stanford Achievement Test and the Otis Lennon Mental Ability Test.

Chapter IV

Analysis of Data

Purpose

The purpose of this study was to determine whether the creative thinking abilities of seventh and eighth grade students could be strengthened through the use of classroom activities designed to enhance fluency, flexibility, and originality. A second purpose was to investigate the relationships between IQ and creativity, and between reading comprehension and creativity.

Findings and Interpretation of Data

The null hypotheses in this study were as follows:

There is no significant difference between the mean scores of the pretest and the posttest of the Torrance Tests of Creative Thinking in the area of fluency after an eight week treatment program.

There is no significant difference between the mean scores of the pretest and the posttest of the Torrance Tests of Creative Thinking in the area of flexibility after an eight week treatment program.

There is no significant difference between the mean scores of the pretest and the posttest of the Torrance Tests of Creative Thinking in the area of originality after an eight week treatment program.

There is less than a moderate (r^2=.25) relationship existing between creative thinking ability and intelligence.

There is less than a moderate (r^2=.25) relationship existing between results on a test of reading achievement and a creative thinking test.

The Appendix contains frequency distributions for the creativity factors.

A correlated *t* test for dependent measures (one-tailed) was used to compare the pretest and posttest scores in the creative thinking components of fluency, flexibility, and originality.

Analysis of the data in Table 1 resulted in failure to reject the first two null hypotheses. The differences between the mean scores on fluency and flexibility pre- and posttests were not statistically significant ($p<.05$). The difference between the pre- and posttest of originality was significant showing a *t*-value of 1.39 compared to the required *t* of 1.319. The data in Table 1 do not fully support the hypothesis of creative thinking abilities

being enhanced through the use of classroom activities.

Table 1

t test of Differences of Pretest and Posttest Scores on Three Variables of Creativity

	fluency		flexibility		originality	
	pretest	posttest	pretest	posttest	pretest	posttest
mean	90.71	92.54	39.46	38.67	95.83	111.00
S.D.	27.68	33.17	8.73	9.44	39.41	49.62
difference in means	1.83		-0.79		15.17	
t-value	.26		-0.32		1.39	
required t-value	±1.319		±1.319		±1.319	
sig. 1-tail.	0.3981		0.3752		0.0872	

N=24

$p < .05$

Additional purposes of this study were to investigate the relationships between IQ and creativity, and between total reading comprehension scores and pretest and posttest creativity scores. The correlation matrix appears in Table 2.

The Appendix contains frequency distributions for IQ and reading scores.

Table 2

Correlation Matrix between IQ, Reading Comprehension, and the Creativity Variables of Pretest and Posttest

	Prefluency	Preflex.	Preorig.	Postfluency	Postflex.	Postorig.	IQ
Prefluency							
Preflexibility	.82						
Preoriginality	.93	.69					
Postfluency	.34	.30	.28				
Postflexibility	.12	.11	.16	.82			
Postoriginality	.30	.21	.30	.92	.84		
IQ	.28	.29	.29	.17	.10	.17	
Total Reading	.01	.06	.01	.03	.03	.02	.54

The coefficient of determination (r^2) was applied to the data. This coefficient indicates the percentage of the variation in scores on the dependent variable that is explained by knowing the variation in the independent variable. Refer to the Appendix for the value ranges for various relationships.

There was a strong relationship between fluency and flexibility; 67 per cent of flexibility variation was explained by fluency. A strong relationship existed also between originality and flexibility on the posttest, but only a moderate relationship was found between those two variables on the pretest. There was a very strong relationship between originality and fluency. The same weak relationship existed between postfluency and preflexibility, postoriginality and prefluency, and pre- and postoriginality. Concerning the creativity variables for the pre- and posttest, no important relationship existed between them and total reading, and only weak relationships existed between them and IQ. Knowing IQ told extremely little about how a student would perform on the creativity posttest. Performing a multiple linear regression involving total reading, postoriginality, and IQ showed IQ explaining approximately 36 per cent of postoriginality, which indicated that the better the reader, the worse the postoriginality score. A multiple linear regression with the dependent variable of postfluency and the combined independent variables of IQ, total reading, and prefluency showed IQ as the best predictor of postfluency, but only accounting for 12 per cent of the postfluency score. The remaining relationships were not important in the analysis of data.

Although the correlation was poor, the effect of instruction was not necessarily poor. Prefluency explained 12 per cent of postfluency. Certain students increased in fluency after the treatment. However, overall there was no significant change. The relationship between pre- and postflexibility was almost zero (r^2=.01) showing only one per cent of the variation being explained. In pre- and postoriginality nine per cent of the variation was explained. In originality there were many dramatic losses, but also some dramatic gains. No statistical significance was found between the means of pre- and posttest originality (see Appendix for scores).

Summary

The findings of this study fail to reject all the null hypotheses. No statistically significant mean score differences were established between pre- and posttesting of the creativity factors of fluency and flexibility. There was a significant difference in means for originality. This indicates that all three creative thinking abilities of seventh and eighth graders were not enhanced by an eight week treatment program. However, some students did show dramatic improvement.

Correlations between IQ and creativity, and total reading comprehension and creativity were also established.

The correlations between IQ and the creativity variables ranged from no important relationships upward to those approaching a weak relationship. No significant relationship was found between total reading comprehension and the creativity variables. A weak relationship was found between reading and IQ scores.

Chapter V

Conclusions and Implications

Purpose

The purpose of this study was to determine whether the creative thinking abilities of seventh and eighth grade students could be strengthened through the use of classroom activities designed to enhance fluency, flexibility, and originality. A second purpose was to investigate the relationships between IQ and creativity, and between reading comprehension and creativity.

Conclusions

The results of this study failed to reject the null hypotheses which stated that there would be no statistically significant differences between the mean scores of the pretest and posttest measuring the creativity components of fluency and flexibility. There was a significant difference concerning originality.

This study's results show that an eight week treatment program combining individual, small group, and whole group activities was not totally effective in strengthening seventh and eighth graders' creativity. However, some students showed a marked increase in ability in certain

creativity variables, which suggests that the instruction was not necessarily without merit.

Nothing stronger than a very weak relationship was found between IQ and the creativity variables. In Hicks's (1979) study, a majority of weak relationships was found between IQ and the creativity factors, with postoriginality and IQ's relationship being strong. This finding might in part be attributed to differences in subjective scoring of the originality of responses. The difference may also be explained in part by possible variations in presentation of instruction. Hicks's data shows a modest relationship existing between IQ and creativity: 44 per cent is due to instruction and 66 per cent is due to IQ. Further research is needed in discovering if the more intelligent individual tends to be more creative.

No important relationships existed between reading and creativity. Compared to these extremely weak correlations, Hicks found weak to very moderate correlations, especially after treatment. However, Hicks's data on the *t* test, not her correlation, support the finding that the eight week treatment program was effective in enhancing creativity of fourth graders. Further investigation is needed concerning the effects of the age of subjects and their experience with reading.

A weak relationship was found between reading and IQ scores.

Neither a total reading comprehension assessment nor deviation IQ appeared to predict the creativity factors of fluency, flexibility, and originality.

Implications for Classroom Practice

This replication of the Hicks (1979) study does not uphold findings that teaching creative thinking skills enhances creativity in all three areas of fluency, flexibility, and originality. However, this researcher found students very receptive and enthusiastic about practicing creativity skills, and some students dramatically improved, as shown by the posttest. Peer pressure at the seventh-eighth grade level, if this is a strong factor in inhibiting creative growth, might be counteracted by exposing students to creativity cultivation programs from grade one through twelve and beyond.

If students receive consistent creativity training through the years, and growth is found, students of both lower and higher ranges of assessed intelligence might produce more useful or noteworthy ideas and products than if not encouraged to be flexible, fluent, and unique in thinking.

Implications for Further Research

To establish reliability of results this study using seventh and eighth graders could be repeated.

Using a population that had received formal, concentrated instruction in creativity skills prior to reaching junior high might be useful in measuring creativity growth after a second creativity program.

Research using a second posttest long after the first posttest with no new treatment other than total reading development could help determine the long term effects of creativity training.

Growth could be investigated by employing a treatment program lasting longer than eight weeks, at any chosen grade level. Perhaps a greater percentage of a population than shown in either this or Hicks's study would exhibit increases in creativity.

Comparing a control group and a treatment group may be useful at different grade levels or with various intelligence ranges.

Further research investigating teacher creativity, attitude, and classroom management could prove relevant.

The relationships between IQ and creativity, and between reading and creativity need further examination. This study did not find that the more

intelligent subject was also the more creative one.

Summary

The findings of this study fail to reject the null hypotheses, except for the originality factor. No statistically significant mean score differences were established between pre- and posttesting of the creativity factors of fluency and flexibility. There was a significant difference between originality pre- and posttest means. This indicated that all three involved creative thinking abilities of seventh and eighth graders were not enhanced by an eight week treatment program. However, some students did show dramatic improvement.

Correlations between IQ and creativity, and total reading comprehension and creativity were also established. The correlations between IQ and the creativity variables ranged from no important relationships upward to those approaching a weak relationship. No significant relationship was found between total reading comprehension and the creativity variables. A weak relationship was found between reading and IQ scores.

REFERENCES

Barron, F. Basic research in esthetic education: Final report. Washington, D. C.: Office of Education, 1975. (ERIC Document Reproduction Service No. ED 111 751)

Begy, G. L., & Hicks, C. G. The development of Creative thinking and its relationship to IQ and reading achievement. Reading World, 1980, 20, 44-52.

Belk, J., Shelton, A. W., & Wollenberg, J. P. Convergent and divergent methods of teaching spelling in relation to creativity, 1982. (ERIC Document Reproduction Service No. ED 218 659)

Boersma, F. J., & O'Bryan, K. An investigation of the relationship between creativity and intelligence under two conditions of testing. Journal of Psychology, 1968, 36, 341-348.

Circirelli, J. G. Form of the relationship between creativity, IQ, and academic achievement. Journal of Educational Psychology, 1965, 56, 303-308.

Daniels, R. R. Fostering creative behavior among university women. Emporia State University, Kansas, 1984. (ERIC Document Reproduction Service No. ED 242 276)

Despos, C. M. A study of the effect of selected teaching strategies on creative thinking ability and reading comprehension. Masters in Education Thesis, the State University of New York at Brockport, 1980.

Drevdahl. J. E. A study of the etiology and development of the creative personality. Coral Gables, Florida: Miami University, 1961. (ERIC Document Reproduction Service No. ED 002 776)

Eberle, R. F. Training and teaching for creative productive thinking. Edwardsville, Illinois: American of Edwardsville, 1967.

Edwards, M. P., & Tyler, L. E. Intelligence, creativity and achievement in a nonselective public junior high school. Journal of Educational Psychology, 1965, 56(2), 96-99.

Feldhusen, J. F., Denny, T., & Condon, C. F. Anxiety, divergent thinking, and achievement. Journal of Educational Psychology, 1965, 56 (1), 40-45.

Feldhusen, J. F., & Treffinger, D. J. Teaching creative thinking and problem solving. Dubuque, Iowa: Kendall/Hunt Publishing Company, 1977.

Flescher, I. Anxiety and achievement of intellectually gifted and creatively gifted children. Journal of Psychology, 1963, 56, 251-268.

Getzels, J. W., & Jackson, P. W. Creativity and intelligence. New York: Wiley, 1962.

Glover, J. A. A creativity-training workshop: short-term, long-term, and transfer effects. Journal of Genetic Psychology, 1980, 136(1), 3-16.

Guilford, J. P. Personality. New York: McGraw-Hill, 1959.

Guilford, J. P. Varieties of creative giftedness, their measurement and development. Gifted Child Quarterly, 1975, 19(2), 107-121.

Haggard, M. R. Creative thinking -- reading activities (CT-RA) as a means for improving comprehension. University of Missouri, Kansas City. Dissertation Abstracts International, 1977, 38, 610-11 A.

Hicks, C. G. The development of creative thinking and its relationship to IQ and reading achievement. Masters in Education Thesis, the State University of New York at Brockport, 1979.

Kurtzman, K. A study of school attitudes, peer acceptance, and personality of creative adolescents. Exceptional Children, November, 1967, 34, 157-162.

Lytton, H. Creativity and education. New York: Schocken Books, 1972, 92-112.

MacKinnon, D. W. The nature and nurture of creative talent. American Psychologist, 1962, 17, 484-495.

Milgram, R. M. Creativity as original problem-solving in gifted and nongifted lower- and middle-class children. Tel Aviv University (Israel); Virginia Polytechnic Institute, Blacksburg, 1981. (ERIC Document Reproduction Service No. ED 203 558)

Miller, J. H. The effectiveness of training on creative thinking abilities of third grade children. University of Alabama. Dissertation Abstracts International, 1975, 35, 7032 A.

Osborn, A. F. Applied imagination. New York: Charles Scribner's Sons, 1953.

Sisk, D. Relationship between self concept and creativity: Theory into practice. Gifted Child Quarterly, 1972, 16(3), 229-234.

Skipper, C. E. A longitudinal study of the development of creativity. Dayton City Schools, Ohio, 1970. (ERIC Document Reproduction Service No. ED 046 150)

Thomas, S. J., & Feldhusen, J. F. To spark an interest: Think creatively. Gifted Child Quarterly, 1971, 15(1), 36-41.

Torrance, E. P. Guiding creative talent. Englewood Cliffs, New Jersey: Prentice-Hall, 1962.

Torrance, E. P. Education and the creative potential. Minneapolis: The University of Minnesota Press, 1963.

Torrance, E. P. Can we teach children to think creatively? Journal of Creative Behavior, 1972, 6(2), 114-133.

Travers, R. M. W. Educational psychology. New York: Macmillan, 1973.

Treffinger, D. J., & Ripple, R. E. The effects of programmed instruction in productive thinking on verbal creativity and problem solving among elementary school pupils. Cornell University, Ithaca, New York, 1968. (ERIC Document Reproduction Service No. ED 030 156)

Walker, W. J. Creativity and the high school climate. Syracuse, New York: Syracuse University, 1964. (ERIC Document Reproduction Service No. ED 003 440)

Wallach, M. Idealogy, evidence, and creativity research. Contemporary Psychology, 1973, 18, 162-164.

Wallach, M., & Kogan, N. Modes of thinking in young children. New York: Holt-Rinehart, 1965.

Williams, T. M., & Fleming, J. W. Methodological study on the relationship between fluency and intelligence. Developmental Psychology, 1969, 1, 155-162.

Yee, G. F. The influence of problem solving instruction and personal-social adjustment upon creativity test scores of twelfth grade students. Doctoral dissertation, Pennsylvania State University, 1964. Dissertation Abstracts International, 1973, 28, 117 A. University Microfilms No. 63-7820.

APPENDICES

APPENDIX A

HICKS LESSONS

Hicks Lessons

Lesson 1

Objectives

1. The class will be able to generate at least 20 words that begin with the dr consonant blend.
2. Students will be able to list at least 10 words that begin with the gr consonant blend.

Procedure

The instructor will ask the students to name words that begin with dr. The words will be written on the chalkboard. The students will then work individually for five minutes on lists of words that begin with gr. They will be encouraged to list as many words as possible.

Evaluation

Students will receive one point for each word on their lists.

Lesson 2

Objectives

1. The class will be able to generate at least 15 words that can be made from the letters in the word encyclopedia.
2. Students will be able to list at least 15 words that can be made from the letters in the word dictionary.

Procedure

The instructor will write the word ENCYCLOPEDIA on the chalkboard. The class will be asked to name words that can be made using the letters found in the word encyclopedia. Words will be written on the chalkboard. The students will then work individually for 5 minutes listing words from the letters in the word dictionary.

Evaluation

Students will receive one point for each word on their lists.

Lesson 3

Objectives

1. The class will be able to generate a list of at least 15 things that are round.
2. Students will be able to produce a list of at least 15 things that are square or rectangular.
3. Students will be able to identify unique responses.

Procedure

The instructor will draw a circle on the chalkboard and ask the students to name things that are round. A square and a rectangle will be drawn and students will be encouraged to write as many things as they can think of that are square or rectangular in a 5 minute period.

Evaluation

Answers will be shared with the class. Students will receive one point for each response and two points for each response that no one else in the class thought of.

Lesson 4

Objectives

1. The class will be able to produce a list of at least 20 words that begin with the letter c.
2. The class will be able to identify which words begin with a soft c sound and which begin with a hard c sound.
3. The class will be able to identify rules that determine whether the c is hard or soft.

Procedure

The instructor will ask the class to name words that begin with the letter c. The words will be written on the chalkboard. Students will be asked to identify the words that begin with the s sound and the words that begin with a k sound. A discussion of spelling patterns and rules will follow.

Evaluation

Instructor observation of class participation in this activity will occur.

Lesson 5

Objectives

1. The class will be able to list at least 20 words that begin with a capital letter.
2. The class will be able to categorize responses in order to make rules for capitalization.

Procedure

The instructor will ask the class to name words that begin with a capital letter. The words will be written on the chalkboard. Students will be asked to put the words in groups according to why they begin with a capital letter (names of people, months, cities, etc.). The instructor will tell the students that these groups are called categories. The instructor will ask if there are any other categories that were omitted. The students will then generate rules for capitalization which will be written in chart form.

Evaluation

Instructor observation of class participation in this activity will occur.

Lesson 6

Objectives

1. Students will be able to identify at least 10 items associated with a certain color.
2. Students will be able to identify unique responses.

Procedure

The instructor will give the students their choice of either red, green, or white construction paper. Students will be asked to draw or write things that are the color they have chosen.

Evaluation

After 10 minutes, students will share their papers with the class. Class members will decide which is the most original item on each student's paper.

Lesson 7

Objectives

1. Students will be able to generate at least 10 adjectives that describe a specific picture.
2. Students will be able to categorize the adjectives in terms of attributes being described.

Procedure

The students will choose a magazine picture. The picture will be pasted to a piece of construction paper. The students will write words around the picture that describe it. On the back of the paper students will list the adjectives that they have written in categories (size, shape, color, etc.).

Evaluation

Students will earn one point for each adjective and two points for each category identified.

Lesson 8

Objectives

1. The class will be able to apply the rules of brainstorming given a problem to solve.
2. The class will be able to generate at least 10 solutions to a hypothetical problem.

Procedure

The instructor will introduce the rules of brainstorming to the class. A chart presenting the rules will be hung up on the wall. The instructor will then ask the students to brainstorm solutions to the following problem: Joe has severe hiccoughs and is scheduled to perform a trumpet solo for the school's Spring Concert in five minutes. What should he do? The instructor will record responses on the chalkboard.

Evaluation

The class will evaluate itself orally on this activity. A discussion of whether the rules of brainstorming were adhered to will follow.

Lesson 9

Objectives

1. Students will be able to work in small groups using the rules of brainstorming given a hypothetical problem to solve.
2. Students will be able to generate at least 10 solutions to a hypothetical problem.
3. Students will be able to produce and identify unusual responses.

Procedure

The instructor will present the following problem to the class: Elizabeth came home from school and found that the living room furniture was gone. What had happened? The students will work in groups of four or five to generate possible causes for approximately 10 minutes. The groups will be encouraged to produce as many unusual responses as possible.

Evaluation

Group responses will be shared. Students will vote for the most unusual response.

Lesson 10

Objectives

1. Students will be able to work in pairs using the rules of brainstorming to produce alternate uses for a familiar subject.
2. Students will be able to categorize their responses.
3. Students will be able to identify unique responses.

Procedure

The instructor will tell the students to look at their pencils and make a list of other things pencils could be used for. The students will be encouraged to use their imaginations, and they will be reminded that there are no wrong answers in this type of activity. After 10 minutes, each team will share its most unusual response with the class. These will be written on the chalkboard and the instructor will aid the class in categorizing the responses as to the way the pencil is used (as a building material, as a tool, to make noise, etc.). Students will then categorize their lists.

Evaluation

Each team will receive one point for each answer and two points for each different category that is identified. A winning team will be announced.

Lesson 11

Objectives

1. Students will be able to list at least 10 questions that they would ask a man from Mars.
2. Students will be able to identify their two most unique questions and respond to them.

Procedure

The instructor will ask the students what they would do if they met a man from Mars. After a few minutes of discussion, students will be asked to list all the questions they would ask this visitor from outer space. After 10 minutes of work time, the students will be asked to write answers to their two best questions.

Evaluation

Students will be evaluated on the number of questions and the originality of the questions they choose to answer.

Lesson 12

Objectives

1. The class will be able to generate alternate uses for an ordinary object.
2. Students will be able to apply one of their ideas to produce a product.

Procedure

The instructor will give each student a box of toothpicks and lead a discussion as to what could be made with the toothpicks. The students will be given 15 minutes to make something.

Evaluation

The students will share their finished products and the class will vote for the most original.

Lesson 13

Objectives

1. Students will be able to generate at least 10 solutions to a hypothetical situation.
2. Students will be able to produce unusual responses.

Procedure

The instructor will present the following situation to the class: You woke up and looked out your bedroom window and saw that everything in sight had turned green! What had happened during the night? Students will be asked to write as many reasons for this situation as possible in a 10 minute period.

Evaluation

Responses will be shared with the class. Students will receive one point for each response and five points for each response unlike any other.

Lesson 14

Objectives

1. The class will be able to generate a list of famous people from the past.
2. Students will be able to write at least 10 questions that they would ask one of the people on the list.

Procedure

The instructor will initiate a discussion of what makes someone famous. The class will then supply names of famous people which will be written on the chalkboard. The instructor will ask the students to write questions that they would ask one person on the list if he/she were alive today. Students will be encouraged to write questions that deal with factors concerning the person's accomplishments.

Evaluation

Students will be evaluated on the number of questions written.

Lessons 15 & 16 (two periods needed to complete this activity)

Objectives

1. Using the lists made during the previous lesson, students will be able to identify unique questions.
2. Students will be able to present a skit based on their questions.
3. Students will be able to evaluate their own work.

Procedure

The students will be asked to identify their two most unusual questions and write creative answers to them. Each student will present a short skit to the class based on their questions and answers.

Evaluation

Students will evaluate themselves on this activity by writing a review of their performance.

Lesson 17

Objectives

1. Students will be able to work in pairs to find alternate solutions to a problem.
2. Students will be able to produce a product based on original ideas.

Procedure

The instructor will ask the class to imagine that there is a shortage of every type of cloth. Students will work in pairs to design clothing made from other substances. Quality rather than quantity will be encouraged. They will share their drawings with the class.

Evaluation

Instructor observation of class participation in this activity will occur.

Lesson 18

Objectives

1. Students will be able to generate alternate uses for a common object.
2. Students will be able to identify original ideas.

Procedure

The instructor will give each student a marshmallow and ask students to use their imaginations to come up with other ways a marshmallow could be used. They will be told to draw pictures of their best ideas. Quality rather than quantity will be encouraged.

Evaluation

Students will receive five points for each alternate use that no one else thinks of.

Lesson 19

Objective

Students will be able to produce a product based on their drawings from the previous lesson.

Procedure

The students will be told to imagine that they work for an advertising agency that must sell marshmallows for a non-edible use. Students will choose their most original drawing from the previous day and design a magazine advertisement for their marshmallow product.

Evaluation

Students will share their ads with the class and a discussion of whether the marshmallow product would sell will follow.

Lessons 20 & 21 (two periods needed to complete this activity)

Objectives

1. Students will be able to work in small groups to brainstorm questions on a specific topic.
2. Students will be able to work in small groups to prepare and present a skit based on their questions.

Procedure

The instructor will ask the class if they have seen ducks flying south. They will be asked to imagine what they would say to the ducks if they could talk to them. The class will be divided into groups of four or five to brainstorm questions that they would ask the ducks. They will then be directed to write a short skit of conversation between themselves and the ducks.

Evaluation

The groups will share their skits with the class.

Lesson 22

Objectives

1. The class will be able to generate a list of things electricity is used for.
2. Students will work in pairs to find alternate ways of accomplishing things on the list without electricity.

Procedure

After a science lesson (review at the seventh/eighth grade levels) involving electricity, the instructor will ask the class what electricity is used for. Responses will be listed on the chalkboard. Students will be asked to work in pairs to find different ways of doing everything on the list if electricity was not available.

Evaluation

Each team will earn five points for each response no one else has.

Lessons 23 & 24 (two periods needed to complete this activity)

Objective

Students will work in groups to prepare and present an argument based on a hypothetical situation.

Procedure

The instructor will ask the students to imagine that a law is being considered that would outlaw the use of electricity in the United States. In groups of four or five the students will be asked to prepare an argument for or against this law. Arguments will be shared with the class and voting on the proposed law will follow.

Evaluation

Instructor observation of class participation of this activity will occur.

APPENDIX B

INDIVIDUAL SCORES ON CREATIVITY VARIABLES FOR PRETEST AND POSTTEST

Individual Scores on Creativity Variables for Pretest and Posttest

student	preflu.	postflu.	preflex.	postflex.	preori.	postori.
1	126	146	51	46	136	157
2	67	150	37	68	74	226
3	154	72	60	35	179	88
4	67	100	25	43	89	156
5	111	153	41	48	103	193
6	71	61	33	35	74	76
7	81	96	42	36	69	104
8	69	61	33	37	72	74
9	91	70	44	29	92	89
10	75	59	37	32	80	62
11	141	85	52	38	157	90
12	70	61	34	26	67	52
13	79	96	47	35	68	71
14	134	119	44	40	175	174
15	87	142	32	50	68	157
16	119	82	38	37	159	96
17	83	122	37	47	108	124
18	50	44	25	22	33	34
19	102	121	50	37	99	171
20	82	83	40	41	78	115
21	74	59	34	30	89	68
22	94	78	35	32	80	96
23	99	106	47	47	112	130
24	51	55	29	37	39	61

APPENDIX C

INDIVIDUAL SCORES ON INTELLIGENCE AND READING

Individual Scores on Intelligence and Reading

student	intelligence score	total reading score
1	117	9.2
2	102	7.8
3	105	8.2
4	106	9.6
5	103	8.5
6	98	8.4
7	106	8.5
8	120	10.2
9	97	8.5
10	97	7.6
11	116	9.4
12	106	12.3
13	97	6.3
14	94	6.1
15	107	9.0
16	117	8.2
17	102	7.9
18	98	8.2
19	126	9.4
20	109	8.5
21	116	7.7
22	92	6.0
23	107	11.9
24	92	6.2

APPENDIX D

VALUE RANGES FOR
CORRELATION MATRIX RELATIONSHIPS

Value Ranges for Correlation Matrix Relationships

r	r^2	Descriptor
1.00	1.00	Perfect Relationship
.99	.98	Very Strong Relationship
.90	.81	
.89	.80	Strong Relationship
.80	.64	
.79	.63	Moderate Relationship
.60	.36	
.59	.35	Weak Relationship
.30	.09	
.29	.08	No Important Relationship
.10	.01	
0.00	.00	No Relationship